MORE EFFICIENT ORGANIZATION AND MANAGEMENT OF X, Y AND CO

by

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Contents.

CHAPTER I.

INTRODUCTION.

Efficient organization and efficient management are the most potent forces in the manufacturing world today. The effect of efficient orgination is particularly noticeable today because of the severe competition which now prevails. When efficient methods are intelligently and properly applied to a business, the development is often very great. Many firms are beginning to recognize the fact that great economy can be effected by the introduction of rational and efficient systems of factory and office administration, which will cover the more important details of factory work. Few, however, realize how great might be the increase in the efficiency of their organization, and how large a consequent saving might be effected, if they but possessed a system of efficient factory and office administration, founded upon principles which tend to develop at least an approximation to that ideal condition where every man- workman, foreman, and superintendant- is constantly working toward one common end; namely, " THE GOOD OF THE COMPANY."

To secure a maximum efficiency from any sort of industrial establishment requires an able organization, and this organization must extend to every operation performed in the factory.

The aim of this thesis is to present the duties of the officials that will bring about an efficient organization - both factory and office administration for a small electric jobbing plant. The output of the factory is a line of specially designed dynamos used in connection with gasoline engines as generating sets. Such a set produces current for house, small town or boat lighting; for wireless operations, battery charging, or electric cooking. The outfit is

especially well adapted for motion picture projection, and for search lights. The firm does a great deal of repair work, both armature winding and the overhauling of machines in the factory and"on the job". Still another activity of the concern is the repairing and charging of storage batteries. The firm also makes a specialty of repairing starting devices and ignition systems of automobiles.

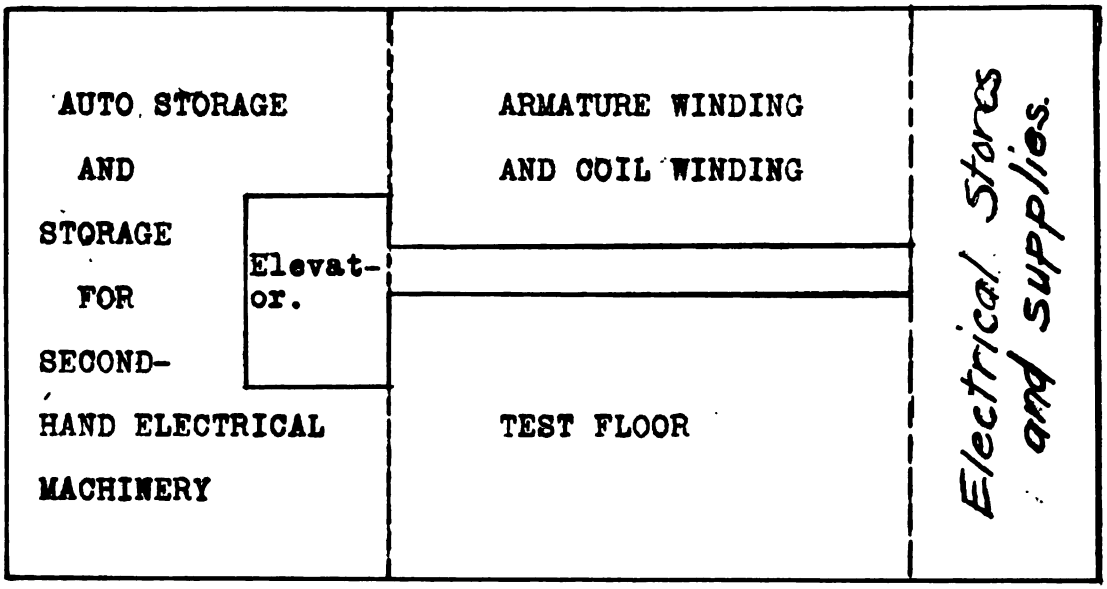
Owing to the numerous operations performed, and to the variation of the operations, it is very difficult to install any system of scientific management, but I will endeavor to point out rules which will lead to an efficient and systematized plan of organization and management which will harmonize with the location and present conditions of the factory.

CHAPTER II.

THE LAYOUT OF THE FACTORY

The principal features of the plant are set forth in the accompanying sketch. The building is of two stories. The power for the plant is furnished by a water wheel, which in turn runs a direct current generator, and thus furnishes electric power which is delivered to the various portions of the plant where it is desired. In case of a break-down or of ice-clogging the water wheel, or loss of power for any other reason, the power for the factory is furnished by the central station.

On either side of the factory are railroad terminals upon which incoming and outgoing freight can be handled with ease. Between the factory and the railroad tracks is a roadway, so as to handle drayage, etc., readily. In front of the factory is a main thorofare upon which an immense amount of traffic is done. Upon this thorofare a great deal of auto-traffic passes from the city in which the plant is located, to the neighboring cities. It is therefore found advisable to have a display window in front of the plant in order to advertise the automobile supplies carried in stock and the auto repairing done by the factory.



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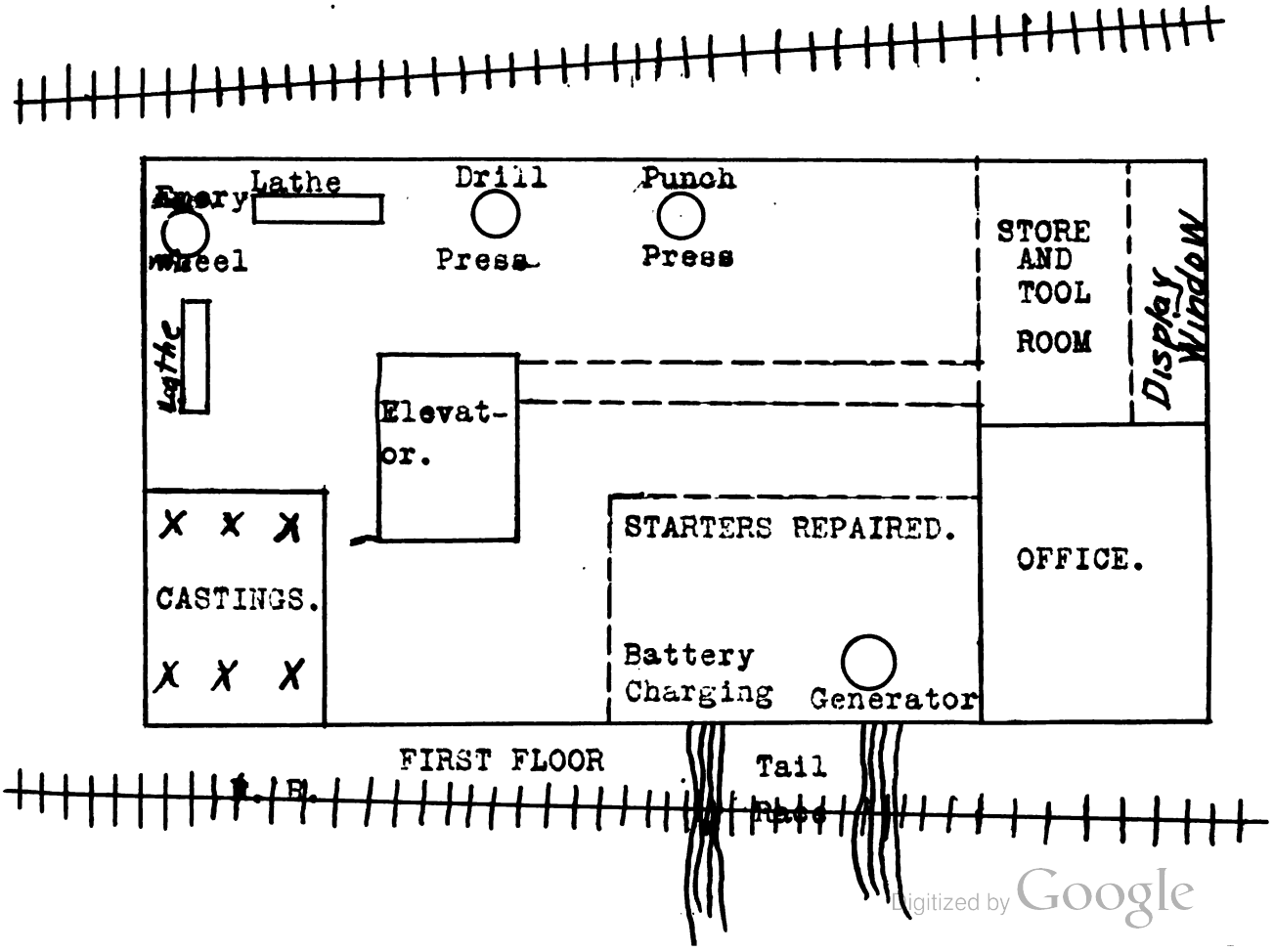
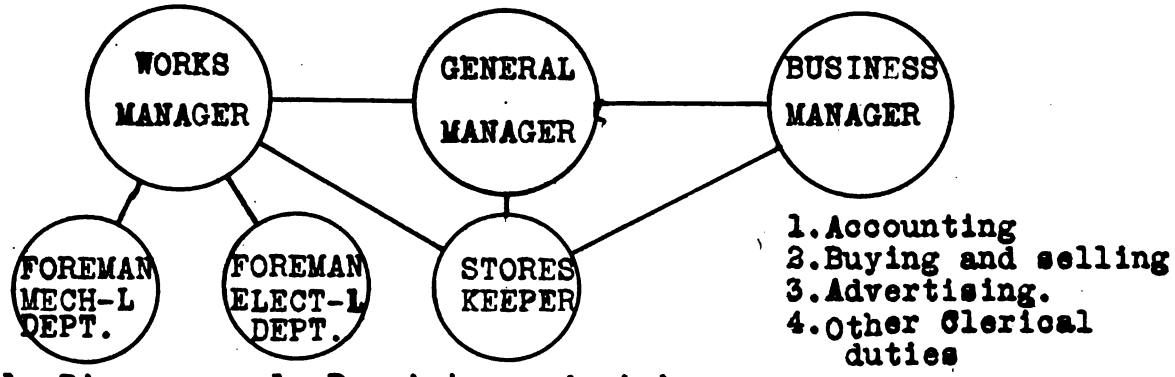


CHAPTER III

THE ORGANIZATION.



The concern is a corporation. The incorporators are the General Manager, the Works Manager, and the Business Manager, which are noted above. The General Manager has the controlling stock of the organization. More capital is to be furnished, if desired. This is probable because the organization is anticipating rebuilding. The issue of bonds is likely to be the means selected.

It is my purpose from here on to enumerate the duties of the incorporators and to lay particular emphasis on the efficient system of " keeping track" of the stores and supplies.

CHAPTER IV.

THE GENERAL MANAGER'S DUTIES.

The general manager of the jobbing concern should not try to perform personally both the duties of his office, and those of every other official of the plant. The duties of all other officials are set forth in brief instructions, but the general manager must know that each official thoroughly and continuously performs his own work in a manner in keeping with his instructions. Everyone in the organization should keep a copy of his instructions before him. The officials' duties are not only limited to the instructions before them, but they are to do more than the instructions call for. If a man is promoted the instructions stay with the job and govern the man who takes the vacant position.

The general manager must receive written and classified data from every department, and written reports of tests performed on machinery before it leaves the plant. In so doing, he will have classified data, which in the aggregate will surpass any man's knowledge in the plant. The information conveyed by the workingmen in these reports should contain:

1. The order number.
2. The reports of all observed data.
3. Suggestions for improvements of the methods used in arriving at the results, if there be any improvements.

It is his duty to take care of the suggestion boxes around the plant. In order to encourage new ideas on the part of the employees and to arouse their interest in the management generally, the suggestion system has been introduced into the factory.

It is found to benefit both the employer and the employee. Very often practical suggestions for improving methods are rewarded by prizes or remunerations. Small boxes are distributed thru-out the factory and the office. They have a slit thru which the written suggestion may be dropped. Each box is provided with a small pad of paper from which leaves may be detached. A carbon sheet is inserted so that there may be a duplicate for the writer for future reference. Each suggestion must be signed by the writer in order to be considered. They are collected daily by a clerk who delivers them to the general manager who considers the suggestions and decides on the rewards. The system produces some wonderful ideas, sometimes of great value.

No former or prospective customer should have cause to complain of being unable to obtain, in reply to his first request, full and complete information. Every complaint that comes in, whether thru the mail, by telephone or telegraph, should, in an organization of this small size, be seen and acted upon by the general manager. The general manager, knowing the instructions of each official, knows exactly on whom to place the blame. If it should happen that any of the instructions before the official are not clear enuf to fix the responsibility, they should, at once, be changed so that their meaning is explicit.

Another important duty of the general manager is to keep every department supplied with new blood and new men from the universities and technical schools. With proper training and experience, such men are a valuable asset in every department of the concern.

The general manager being well informed in machine making in all of its branches, will make headway by taking a list of orders with their promised dates of delivery, to see if any are overdue, and, if so, what is needed to complete them, and see that assistance is given for their speedy completion. He, then, should take the next most urgent orders in like manner, and so on, until all of the details are well at hand. In a short time this work will put the manager in intimate contact with ~~every~~ every department and every employee in the establishment. While getting this experience, or making this investigation, he will have come in contact with any lame spot in the organization, and thereby, he can begin, in a small way, to better conditions and give help in every department, so far as they need this help. He will see what is needed, and also, see where to begin to really improve the quality of the work.

His next duty is to get from the cost department a statement as to what each department is capable of producing. Then he can increase or decrease such departments as have the least relative capacity, in order to bring about the needed balance between the departments.

The general manager must be very strict with his foremen in regard to the matter of frequent changes of men. Too frequent changes prevent an up-to-date condition, and the building up of a well-informed crew of men. Each foreman must be exceedingly explicit in giving out work to his men, especially such work as they are not thoroughly acquainted with.

And lastly, it is very essential that the general manager keep in close touch with the other incorporators; namely, the Works Manager, and the Business Manager. It is also very important that he should keep in immediate contact with the stores clerk and the amount of stores on hand, or on the road, thereby, having a check on all material so it will be in its proper place when the job is commenced.

CHAPTER V.

THE WORKS MANAGER'S DUTIES.

Again, the Works Manager is not to try to perform personnally all of the duties of his office. He should do all the planning that is necessary and the prime function of his office is "How and when an operation is to be done". By doing this planning the "one best way" for performing an operation is ascertained before a cent has been spent either in material or labor. The work of planning is to design the particular work, preparing proper details and drawings, to analyse the work in its various elements, and to route it in its future course thru the shop."The economies which are brot about are manifold:

1. Classified data can be obtained, which, in the aggregate surpass any one man's knowledge in the plant.

2. Plans are made far enuf in advance so that the material and tools will be on hand and at the machine when the work is commenced.

3. This planning saves the time of the workman in running around the shop looking for tools and material, moreover, he does not have to stop and plan things.

4. If the workman had to plan the operations, he would have to use such tools and supplies as happen to be in the plant, whereas, if the planning is done beforehand, the necessary equipment and supplies can be provided before the commencing of the job." [β]

The number of men employed to do this planning depends upon what kind of work is being performed, because so many different operations are carried out in the above factory.

[β] Organization and Management -- Galloway.

The Works Manager should possess the latest notions of scientific management and be able to apply these where necessary.

He should design all new machinery, attachments therefor, and all special appliances for orders that carry with them guarantees, of time or production. His decisions are final on all designs, but the general manager and the foreman, in the particular department in which the machine or part to a machine is to be built, must, at all times, be consulted where modifications in design are necessary for shop conveniences. He must listen to suggestions from the head machinist.

It is very essential for him to keep in touch with the purchasing department and the material in stock, or the perpetual inventory.

When a repair job comes into the establishment, he should investigate and determine to what department it should be sent.

It is his duty to watch very closely the order-of-work board which is in charge of the stock room man.

At this point, it may be well to explain the order-of-work board. This board contains many hooks, each group being composed of three sets, placed one above the other, showing the progress of the work and the movement of all material from point to point. When a machine is assigned to a particular machine or department, the operation card, which is issued by the Works Manager, is hung on the lowest hook of the series of three hooks. Each machine or working are in the shop is represented on the bulletin board by one of these series of three hooks. Thus when a job is assigned to a machine it shows

that all drawings, instruction cards, etc., are ready; that the materials are on hand and everything is ready for the work to begin. It is then that the operation order which covers a given operation goes on hook No. 3, the lowest hook and the one which represents all " Jobs ahead in the shop" for that machine.

Next, when the materials have been moved to the machine the operation order is moved to the top hook No. 2 " Jobs ahead at the machine".

Finally, when the job is actually begun, the operation order is moved to the top hook, No. 1, " Job at machine".

The Works Manager, or,for that matter, any person interested, can follow the movement of the job thru the shop by watching the operation orders on these three hooks. If a job would be assigned or moved to another machine, the operation order would be assigned to another group of three hooks corresponding to the second machine.

By means of the order-of-work board a whole series of questions which are vital to the management can be answered immediately. They are:

What job shall be done first?

If a machine breaks down what other machine can do the work?

If a man is absent what man or machine can do the job?

What is the cost of any machine for a hour, or what is the total cost of operation going on on all machines in one hour?

In order to acquire data as to the capacity of the

various parts of the factory, the time and the number of the machines used in the operation are marked on the operation or order card. Each machine is numbered and at the end of the month the time of each can be totaled on the machine time card, for comparative purposes. The General Manager or the Works Manager is then enabled to see what parts of the equipment are not being worked to the highest possible efficiency, so that he can make an intelligent effort to get work from them. The old saying, " An idle machine is an actual loss to a concern just the same as wasted material", must be observed.

Although the order-of-work board is consulted frequently by the Works Manager, it is in personal charge of the Stores Keeper who tends to the changing of the operation cards from each hook and sees that the material is at the machine when the operation is to be performed.

Only the Works Manager or the General Manager can change the order of the operation card on the order-of-work board. As I have said, it is the General Manager's duty to take a list of orders, with their promised dates of delivery, and if the orders are overdue or delayed, he or his duly appointed assistant (by no means a common laborer) has the right to change the operation card's order on the order-of-work board.

Besides watching the progress of the work thru the shop, the works manager also vises requisitions for purchases, before they result in orders. As a check upon occasional overbuying, it is his duty to investigat any unusually large order.

The Works Manager should keep in close touch with the time keeping of all men in the production end of the organization,

and hence his hearty cooperation with the time-keeper in the main office.

And lastly, it is the duty of the Works Manager to produce each month, reports which check up with the statistics of the accounting department, and from which the General Manager can calculate the apparent gain or loss of the factory. From this data, the General Manager should issue a report each month, and a final report each year is issued, of which I will speak later on.

Above all, the Works Manager should cooperate with the General Manager on all things which are essential for the upbuilding and future of the organization.

The duties of the electrical and mechanical foremen are explained by the summaries under their subheadings.

STORES AND PURCHASING.

The man in charge of the storeroom must be honest and reliable. Due to his important duty of taking care of the order-of-work board, the task of keeping any of the stores accounting records is not done by him, but it is cared for in the main office. He has no authority to issue purchase requisitions, he receives the materials and supplies, stores them, and delivers them to the machine on the requisitions received with the orders from the order-of-work board. If any additional help is needed in the manual work, it is drawn from the shop.

When an order is issued, the Works Manager or his assistant makes out a requisition (Fig. 1) for the material.

PURCHASE REQUISITION.

Date	Requisition No.
Required for	Purchase order No.
Date wanted	Ordered from
Description of material.	
	Signed _____

Fig. 1.

This is in duplicate and both original and copy are sent to the office. Here it is checked up with the perpetual stores inventory to see if the required amount of material is in

stock, or, to see whether any material in stock could be used for this order. It is then numbered with an automatic numbering stamp, and if the material is not in stock, investigations are made as to the prices,etc. After the order is placed, the original is kept in the office and the copy is returned to the Works Manager. On both of them the order number and the name of the seller is inserted.

Requisitions for supplies for the shop are issued by the Works Manager when he is notified by the office, or by the stores clerk that the stock is running low and has reached the limit fixed. When new machinery is designed, the Works Manager makes out a bill of material and a requisition for it at the same time. These requisitions come to the office and are dealt with in the same manner as those of Fig. 1.

A record of the quotations and prices paid for previous purchases is kept on a card index (Fig. 2).

Material					
Purchased from	Date	Order No.	Description	Price	Per

Fig. 2.

Reference is made to this to ascertain the latest price and if no recent quotations had been received, inquiries are sent out for prices and shipping dates. When a satisfactory price is secured and early shipment for the proper execution of the order, the regular purchase order (Fig. 3) is issued. A copy of this is kept in the office and bound in a metal post binder.

X, Y and Co. Inc.

Milwaukee Wis.

Requisition No._____ Date _____ Purchase No._____

To _____

_____

_____

Please send us the following:

_____

_____

_____

_____

_____

_____

_____

_____

X, Y and Co. Inc.

_____

Important.

Invoice and shipping receipts must have order number entered on them and be sent to us on the date of shipment.

Fig. 3.

When the invoice is received, it is checked with the order and a memorandum of the date of invoice, quantity received, and the amount of the invoice is entered on the face of the copy of the order in the office. This is found to be an effectual check against approving two invoices for the same material. It also prevents more or less goods being delivered than the order called for. Investigations are then made to see if any questions had arisen regarding the quality which would appear when it is checked against the material-received sheet. It is also checked for price, the extensions are checked, and it finally is approved on a form shown in (Fig. 4).

From _____ Date _____

Purchase Order No.	Quantity Received	Description of material

Received as above

Quality approved

Price examined

Extension checked

Charge to Amount

Approved

A record of prices is kept on cards similar to Fig.3 and an index of the order placed is kept on the form shown in Fig. 5.

Date	Order No.	Material

Fig. 5.

The copies of the unfilled orders are kept from the orders completed, and, as the are few, a general tickler system is not necessary, as notes can be easily made of follow-up movements on the copies of the orders themselves.

The stores system in connection with this plant is relatively simple. There is not must difficulty in keeping books. All of the material and tools have symbols and these are arranged alphabetically in the stock room. The symbols are marked on the ends of the tiers, so that anyone can find any tool or material. The man in charge does no clerical work except to make out a list of the material and supplies received on account of purchase

orders. A copy of this order is given to him at the time it is issued, he knows therefore what goods are on order, when to expect them, and can stop any coming of supplies which were not properly ordered.

The next of the proceedure is as follows: The material arrives continually at the plant from various sources, and on arrival is checked, weighed, and examined by the stores keeper, the copy of the purchase order having, of course, been referred to. He then enters these items on the material sheet, which is sent to the office every day. He receives various shipping memoranda and delivery tickets which come in with the goods. These, he keeps for a time in case any question should arise as to the quantities, etc., when invoices are checked.

During the day the stores keeper is called upon continually to deliver goods from the stock room to various departments. This is done on requisitions received as in Fig. 6 signed by the foremen or the works manager.

REQUISITION ON STOCKKEEPER.

Order No._____ Date _____ No. _____

Pieces	Feet	Pounds	Material

Entered in stock book-_____ Foreman_____

Charge to order _____ Stock keeper____

Fig. 6.

The first thing the storekeeper does on receipt of this requisition is to number it in the upper right hand corner with an automatic numbering stamp. He then hands out or delivers the material and signe the ticket below the foreman's or Works Manager's signature. The requisitions are placed in a box and sent to the office daily. The object of numbering them is to indicate to the office by the fact that the requisitions are numbered in the proper sequence that none are lost after the material is given out.

Material returned to the stock room, such as wire, tape, solder, etc., is recorded in a similar manner to the above requisition(Fig. 5), with the exception that the requisition is a different colored card. It has the heading "CREDIT" on the top instead of "REQUISITION ON STORES KEEPER".

On arrival to the office, these requisitions are recorded against the production order, and also entered on the perpetual stores inventory, which is a loose-leaf sheet (Fig. 7)

Maximum_____ Drawing No.____ Sheet no.____

Minimum_____ Pattern No.____ Price _____

Received			Delivered			
Date	Order	Quantity	Date	Req. No.	Quantity	Balance

Fig. 7.

On each bin or place in which the material is kept, as I have said, there is a card pinned on which the symbols of the materials, and the maximum, and minimum of supplies is designated. It is the Stores Keeper's duty to notify the office, if they fail to observe from their own record, when the stock is running low, or let them know if it is too high.

Besides the records mentioned, there should be a record kept of the different forms for various windings. Due to the great amount of rewinding done to various machines, there are a great many of these forms and a systematic method of storing them is found advisable. A description of the kind and type of machine the coil is for, and the position on the shelf in the stock room on which it is kept, is recorded on this record sheet.

CHAPTER VI.

THE BUSINESS MANAGER'S DUTIES.

The duties of the Business Manager are to have charge of the purchasing and stores keeping in the office, to have charge charge of the time keeping, to have charge of the advertising, to have charge of the expense burden, and of the establishing of a selling price or of a billing price for all work.

The purchasing and stores keeping record have previously been discussed, and the timekeeping in the factory will next be explained.

The proper distribution of labor costs to various orders, and expense accounts for labor, is very essential in an organization. The time keeping system should show the hours expended on each individual order, and the total day's labor. To keep an accurate account of the time spent on a particular job is very essential, because if less time is reported on some job than is actually consumed, some other job must bear the extra burden, thereby causing two different prices for the same job, which might sometimes lead to ill-feeling against the organization.

Due to the variety of work done in the factory, a laborer is paid a time wage.

In the morning, a time ticket is assigned to each workman when he comes into the factory. This ticket is of the form shown in Fig. 8. When the workman is assigned to a job, the works manager or his duly appointed assistant stamps this ticket with the time and fills out the necessary blanks. When the work is completed, the ticket is turned into the Works Manager's desk, the time stamped, and a new job assigned from the order-of-work

board. It is the duty of the Works Manager to keep his men busy all of the time, therefore he should see that the proper number of orders are planned and on the order-of-work board.

At night all of the tickets are collected, and sent to the office. A time sheet for each workman is kept in the office, upon which is entered each day, the time as taken from the time clock, and as compiled from the time card's. Any appreciable variation between the two is investigated. The cost of the workman"s time or his time wage is entered against the order number upon which it was issued on the time ticket.

TIME TICKET.

Workman No. _____ Name _____ Date_____

Order No.	Operation	Hours	Rate	Value

Total _____

_____
Works Manager.

Fig. 8.

THE BOOK-KEEPING SYSTEM.

The system of keeping books is thot to be unique, and is very well adapted to the above concern. The book-keeping involves the keeping of six books, namely: the order book, the stock book, the cost book, the day book, the journal, and the ledger.

From the order book all work that is done in the factory is given an order number. The number is usually attached to the machine, if possible, and the complete data of the kind of machine and other work recorded in the order book. Should any material be used on this job, the number of the stock book and the page of the stock book are recorded in red ink in the order book.

From the page and number of the stock book, the place in the stock book which refers to said order can be ascertained. One page of the stock book is used for all material going out of the stock room, and the other side for all material returned. The difference between the amounts of material is the material used on the job. The page number of the cost book which refers to said order is also recorded in the stock book.

When the job is completed, the cost of material used, and the cost of the labor expended on the job are recorded. Also, as to what the job should "figure up to" at a certain percent profit (of which I will speak later on). Each cost book is given a number and is filled up in the same manner as the stock book.

The number and page of the cost book, and the job number are inserted in red ink in the day book. The day book is a duplicate of the invoice which is sent to the customer.

From the day book this invoice is transmitted to the journal, where it is subdivided into three parts, namely; merchandise, labor, and expense. The journal also contains the day book page.

The billing price and the date of billing together with the page in the journal concerning the order, are then recorded in the ledger.

To explain this system more clearly, I will use an illustration. Among other things, a great deal of repair work such as armature winding is done. For instance, Mr. Smith has an armature for repairs. The date the order was received, the type of machine it is for, and the shaft number of the armature are inserted in the order book and given a number say No. 500. This number is tied on the armature when it goes to the department for repairs. Should any material be used on the job, the number and page of the stock book(as page 10 - book 19) are inserted in red ink in the order book. When the job is completed the date as (6/1/17) when the invoice was billed is inserted in the order book.

(see example of order book)

Now, the material for the job together with the order number appears on page 10 of stock book number 19. On one side of the stock book all of the material going out of the stock room is recorded, and on the other side all of the material returned is inserted.

(see example of stock book)

				Stock book.
499				
		MAY 31 1917.		
500		Mr. A. Smith.		6.10-19
		1- G. E. 500 V. Armature Shaft No. 6328		
	1917	to be repaired.		
	1917	Freight and Cartage $3.50		
		when it was billed		

STOCK BOOK NO. 19 (open up)

No. Order No					Day Book Page
#500				Mr. A. Smith	50
				35# - #21 DCC Magnet wire	
				6 oz. Rope Paper	
				12 oz Empire	

					Stock book.
499					
		MAY 21 1917.			
500		Mr. A. Smith.			5.10-19
	24/17	1- G. E. 500 V. Armature Shaft No.	6328		
		to be repaired.			
		Freight and Cartage $2.50			
		when it was billed			

					10.
		10 # #21-D.C.C. Magnet wire			
		1 Oz. Rope Paper.			
		3 Oz. Emfere.			

Page 50.		COST BOOK - No.6.				
Order No.			Cost Price.		Selling. Price.	
500		Mr. A. Smith				
		25# - #21 D.C.C. wire	18	00	24	00
		5 oz Rope Paper	1	00	4	00
		9 oz Emery	3	00	7	00
		Jones - 10 hrs.	4	50	7	50
		Wood - 5 "	1	50	3	00
		Shaw - 6 "	2	40	4	50
		Freight and Cartage	2	50	2	50
			32	90	52	50

Cost Book		DAY BOOK. June 1, 1917.	Order No.		
P 50-6		Mr. A. Smith	500		
		Repairing Armature		50	00
		Freight and Cartage		2	50
				52	50

June 1			JOURNAL. DayBook	a/c		Mdse		Labor		Expense	
		Mr. A. Smith	50	52	50	35	00	15	00	2	50

57

		LEDGER.			
			Journal Page	Billing Price.	
June	1	Mr. A. Smith	50	52 50	

When the job is completed, all of the material used, together with the labor expended on the job are inserted in the cost book, and calculated to see what the cost of the job was. Also the selling price or billing price of the job at (assume 30%) profit.

(see example of cost book)

The book and page number of the cost book are then inserted in the day book. This day book is a duplicate of the invoice which is sent to the customer.

(see example of day book)

From the day book, the invoice is recorded in the journal, where it is again divided into three parts; namely, merchandise, labor, and the expense or freightage and cartage. The date of billing and the day book page are also recorded in the journal.

(see example of journal)

From the journal, the account is recorded in the ledger.

(see example of ledger)

Perhaps, a year later, Mr. Smith notes that his armature is again in need of repairs. He states that fact to the above concern. From the ledger, it is observed that some work was

done for Mr. A. Smith which amounted to $ 52.50 and was billed on 6 / 1/ 16. Upon referring to the day book on 6/ 1/ 16, it is observed that the charge concerned an armature and the order number of said armature was No. 500. Upon referring to the order book, it is observed whether or not this is the same armature that was repaired before. Upon referring to the cost book the approximate cost of repairs on this armature can be noted by observing what the variation in cost of the different materials are at the present time compared with what it cost a year ago. In this manner, an intelligent estimate can be quoted on the cost of repairs.

ESTABLISHING A SELLING OR A BILLING PRICE.

In establishing a selling price or a billing price on a job, it is the duty of the Business Manager to estimate and charge all of the following material.

1. Charge interest on the net amount of the total investment at the beginning of the business year, exclusive of all real estate.

2. Charge rental on all real estate or building owned by the concern and used in its business at a rate equal to that which would be received if renting or leasing it to others.

3. Charge for non-productive labor, which consists of managers' and clerks' salaries, together with wages for all labor expended for factory betterment.

4. Charge for maintainance and repairs.

5. Charge depreciation on the factory, such as fixtures and buildings, and depreciation of machines, tools, and other materials and equipment.

" The rate of depreciation for buildings is from two to six per cent."

" The rate of depreciation for machinery is from two to twelve per cent, depending upon the kind of machine and the usuage given".

6. Charge the amounts donated or subscriptions paid.

7. Charge all fixed expenses such as taxes, insurance, water power, electric power for lighting and power purposes, fuel, etc.

8. Charge all incidental expenses, such as drayage, postage, office supplies, livery, telegram, telegraph, telephone, traveling, advertising, canvassing, etc.

9. Charge losses of every character, including goods missing or stolen or sent out and not charged, allowances made to customers, bad debts, etc.

10. Charge collection expenses.

11. Charge any expense not enumerated above.

When the sum of all of the foregoing items have been estimated and charged, this expense is then divided by the estimated selling or billing price for the entire year, and it shows the per cent which it costs to run the business.

To this percent the cost of productive labor and the cost of productive material are added and thus an intelligent billing or selling price is arrived at.

THE FINAL REPORT.

As I have said, the General Manager should receive reports and discuss matters with the Works Manager and the Business Manager. Semi-annually an inventory should be taken and the General Manager should issue the following report from the inventory and the subsequent data obtained.

" A. Investment in land, buildings, and equipment.

B. Working capital, cash, work in progress, stock in trade, etc. less liabilities.

Interest, repairs, depreciation, taxes, etc. on A.--$-----

Interest on B,and on loans ----------$-----

Material ----------$-----

Labor ----------$-----

Non-productive labor ----------$-----

Fuel, light, water power, etc. ----------$-----

Designing, drafting, etc. ----------$-----

Total factory cost----------$-------

(-)

Billed to the office at a certain percent of the list price.--$ ------

Apparent gain or loss in factory -------$-------

Sales + unfinished work and stock at the beginning of the year -unfinished work and goods at the end of year$-------

(-)

Cost of selling, advertising, storage, etc. ------$ ------

Net proceeds of sales-------$ ------

(-)

Billed from factory at loss or gain ----------$ ------

$-------

Factory loss or gain ------$-------

Total loss or gain---------$-------

General Manager.

CHAPTER VIII.

THE BIBLIOGRAPHY.

ARNOLD -------- FACTORY MANAGER.

LODGE --------- RULES OF MANAGEMENT.

TAYLOR, F. W.--- SHOP MANAGEMENT.

TAYLOR, F. W.--- PRINCIPLES OF SCIENTIFIC MANAGEMENT.

LEWIS, ST.ELMO-- GETTING THE MOST OUT OF BUSINESS.

DUNCAN --------- THE PRINCIPLES OF INDUSTRIAL MANAGEMENT.

GALLOWAY ------- ORGANIZATION AND MANAGEMENT.

SHAW ----------- FACTORY MANAGEMENT SERIES.

KENT ----------- INVESTIGATING AN INDUSTRY.

In addition to the above references, I have obtained information which aided me in writing this thesis from the course in Factory and Office Administration given by Professor Trumbower, and the course in C. M. E. which is supervised by Professor Callan.

The foregoing thesis is hereby approved as a creditable study of an engineering subject carried out and presented in a manner sufficiently satisfactory to warrant its acceptance as a prerequisite to the degree for which it has been submitted. It is to be understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinions expressed or conclusions drawn herein, but approve the thesis only for the purpose for which it is submitted.

Approved J. G. Callen

Professor of Steam and Gas Engineering.